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STANFORD
ICHTHYOLOGICAL BULLETIN

Published by the
NATURAL HISTORY MUSEUM
Stanford University, California

Volume 1 February 7, 1940 Number 5

THREE NEW SHARKS OF THE GENUS *SPHYRNA* FROM THE PACIFIC COAST OF TROPICAL AMERICA

By Stewart Springer

Through the courtesy of Dr. George S. Myers and the Natural History Museum of Stanford University I was recently given the opportunity to examine specimens of hammerhead and shovelhead sharks from the west coast of tropical America, and to compare them with series which have been collected by Bass Biological Laboratory in the vicinity of Englewood, Florida. The Stanford Museum specimens are of special interest in pointing to an explanation of the contradictory treatment given American hammerhead sharks in the literature of the past 30 years. Sphyrnid sharks in the collections of the United States National Museum, Field Museum of Natural History, the Los Angeles Museum, the Carnegie Museum, the Museum of Zoology at the University of Michigan, The American Museum of Natural History, and the Bingham Oceanographic Collection were also examined. The total number of specimens of *Sphyrna* in these collections is not great and many are embryos. Relatively large numbers of three species of this genus have been available for study from the collections made at Englewood by Bass Biological Laboratory, and have been important in showing the trends of modification of proportions with growth.

Sphyrna vespertina, new species

Sphyrna tiburo Gilbert and Starks, 1904, p. 13.

Types. Holotype, a 769-mm female, Stanford No. 11584, collected by Prof. C. H. Gilbert during the Hopkins Expedition of 1896 at Panama City, Panama. Two paratypes: a 938-mm adult male, Carnegie Museum No. 5675, collected by Mr. A. W. Henn at Guayaquil, Ecuador; and a 520-mm female, Stanford No. 11881, having same data as holotype.

A small species (a 938-mm individual is apparently sexually mature), body moderately compressed; head flattened, spade-shaped, its greatest width about 1.5 times the greatest length of the oculonarial expanse in full-grown individuals, the front margin not lobed, no indentation in the front margin before the nasal apertures, front and side margins of head not clearly confluent in half-grown and mature individuals; length of snout in internasal distance about 1.75 times for

large specimens; mouth well arched, a line through its angles in advance of the posterior edges of the oculonarial expanse; teeth in $\frac{12}{12}\ \frac{2}{1}\ \frac{12}{12}$ to $\frac{14}{13}\ \frac{1}{1}\ \frac{14}{13}$ rows; upper teeth low, the cusps angled toward the outer margins of the jaws, progressively shorter toward the angles of the jaws and nearly or entirely absent on the last row; teeth of the lower jaw entire with slender cusps, cusps low and progressively shorter toward the angles of the jaws, indistinct or absent on the last 4 or 5 rows; first dorsal high, its origin a little behind the end of the pectoral bases; second dorsal with the posterior lobe not greatly produced, length of lobe less than 1.5 times length of base of fin; eyes close to nasal apertures, separated from them by a distance equal to about 1.5 times the diameter of the eye.

This species may be distinguished from others of the genus by characters given in the accompanying key. It is closely allied to *Sphyrna tiburo* of the Caribbean, Gulf of Mexico, and the Atlantic coast of the Americas. Direct comparison of specimens of *vespertina* and *tiburo* shows that the former has a broader and shorter head, greater internasal distance, higher first dorsal, shorter pectoral, greater body compression, and longer caudal fin. The area of the oculonarial expanse has an important relation to the swimming equilibrium of the sharks of this genus, and its development is accompanied by changes in the shape of the body and the relative sizes of the fins. Thus, the reduced pectorals, the relatively high first dorsal fin, the compressed body, and the large caudal fin which are characteristic of the genus, reflect the degree of development of the flattened head. Data from Englewood specimens of *tiburo* and *tudes* indicate that growth is accompanied by a proportionate increase in the width and decrease in the length of the head, by a reduction in the relative size of the pectoral fins, and by an increase in the relative height of the first dorsal fin. In adults of *tiburo* from Englewood there is a measurable difference in proportions of the head in the sexes, the females having slightly wider and shorter heads. It is probable that the maturity factor is important in the determination of any hammerhead.

Sphyrna media, new species

Sphyrna tudes Jordan, 1895, p. 383 (Mazatlan; type of *S. media*); Jordan and Evermann, 1896, p. 44 (in part); Gilbert and Starks, 1904, p. 13 (Panama).
?Cestracion tudes Meek and Hildebrand, 1923, p. 59 (Colon).

Types. Holotype, a 900-mm adult male, Stanford No. 11583, collected at Mazatlan, Sinaloa, Mexico, by the Hopkins Expedition, in 1894. Paratype, a 777-mm female, United States National Museum No. 28160, collected at Mazatlan by Prof. C. H. Gilbert.

A shark of small or moderate size, body compressed, and head flattened into the oculonarial expanse characteristic of the family; caudal fin large; first dorsal high, triangular; second dorsal not excessively low, its posterior lobe short, not more than 1.5 times the length of its base; oculonarial expanse of head regularly oval, the front margin not lobed, no notch before the nasal apertures; a short, shallow, and inconspicuous groove in the front margin of the head originating in back of the nasal flap; mouth large, broadly rounded, well back in head, the angles of the jaws in back of a line through the posterior edges of the oculonarial expanse; eye separated from the nasal aperture by a distance about equal to twice its diameter; teeth not serrate, relatively high, all with cusps; upper jaw teeth angled, narrowly triangular, the cusps slightly

convex on their outer (toward the angles of the jaws) margins and slightly concave on their inner margins; lower jaw teeth similar but more erect and a little narrower; teeth in $\frac{14\ 1\ 13}{14\ 1\ 14}$ and $\frac{14\ 1\ 14}{14\ 1\ 14}$ rows.

In addition to the type material, one specimen, United States National Museum No. 50376, was examined. It is a 520-mm female collected by Prof. C. H. Gilbert at Panama, probably in 1882, and presumably on the Pacific side. It is similar to the Mazatlan specimens except in the character of the teeth which are comparatively higher, with those of the lower jaw resembling the lower jaw teeth of the species described here as *corona*. Meek and Hildebrand (1923, p. 60) mention a specimen from the Atlantic side of Panama which may be *media*, and apparently it is like USNM No. 50376 in the character of the teeth. There may be some question as to whether USNM No. 50376 was taken from the Atlantic or the Pacific, and it would not be surprising to find a species analogous to *media* on the Atlantic side of Panama. (Note: In the papers of Jordan and of Gilbert, "Panama", without any qualifying statement, refers to Panama City, on the Pacific coast. Search through the writings of Doctors Jordan and Gilbert indicates that Dr. Gilbert did no collecting on the Atlantic side of the isthmus during any of his three expeditions, 1880-81, 1881-82, and 1896. Since the entire 1881-82 collection was destroyed by fire at Bloomington in 1883, USNM No. 50376 must have been part of the 1880-81 collection or else from the Hopkins Expedition of 1896, which was led by Dr. Gilbert.—Editor.)

Sphyrna corona, new species

Sphyrna tudes Jordan and Evermann, 1896, p. 44 (in part).

Holotype, a 663-mm adult or sub-adult male, Stanford No. 11882, collected by Prof. C. H. Gilbert at Panama, in 1896.

A small species, body greatly compressed, tail large, head flattened into the oculonarial expanse characteristic of the family; head irregularly oval, the front margin four-lobed, the two central lobes more than twice as large as the lateral ones, greatest width of head about two times length of oculonarial expanse; a shallow notch before the nasal apertures; a shallow inconspicuous groove in the front margin of the head, originating behind the nasal flap and extending for a distance about equal to two times the diameter of the eye; mouth strongly arched (long and narrow), the angles slightly behind the posterior edges of the oculonarial expanse; teeth high, not serrate, all teeth with cusps; teeth of the upper jaw with narrowly triangular angled cusps; teeth of the lower jaw with very slender, needle-like cusps, erect centrally; teeth in $\frac{13\ ?\ 13}{12\ 1\ 13}$ rows; first dorsal high, triangular; second dorsal not excessively low, its posterior lobe not greatly produced, when lifted upward, reaching only about 1.25 times as high as the fin, length of posterior lobe about 1.5 times the length of the base of the fin; pectorals small.

In the lobed head, the nasal groove, erect high teeth, the compression of the body, and the shallow notches before the nasal apertures, this species is truly intermediate between the shovelhead and hammerhead sharks. Apparently it is a well-marked species and should be distinguished from other hammerheads without difficulty by the characters given in the key.

Much of the confusion of the nomenclature of the genus *Sphyrna* may have arisen through varied interpretations of the original description of *Sphyrna*

tudes (=*Zygaena malleus* Cuvier, in Valenciennes 1822, pp. 225-226, pl. 2). No particular specimens are designated as types in Cuvier's account but several specimens are mentioned from the Mediterranean, from Cayenne, and from Coromandel. It is not improbable that these represent more than one species. Cuvier's illustration of *tudes* is not unlike an embryo of the large West Indian species which I have hitherto (Springer, 1939, pp. 32-33) referred to *tudes*, and the description covers this form with accuracy if based on embryos. The type of *corona* may represent the form on which Jordan and Evermann (1896, p. 44) based their account of *tudes*. This individual agrees in many respects with the Cuvier description and figure, although I am of the opinion that no specimens of *corona* were included in the material he described. Garman (1913, pp. 159-160) refers the name *tudes* to the large West Indian form, North and Central American specimens of which are rare in collections. Garman undoubtedly had specimens of the great hammerhead from the collection of the Museum of Comparative Zoology and I have noted one in a hasty search through that material. However, except for specimens collected recently in south Florida I have encountered no other museum specimens of the great hammerhead.

ARTIFICIAL KEY TO CENTRAL AMERICAN *SPHYRNA* EXCEPT THE COMMON HAMMERHEADS OF THE *S. ZYGAENA* GROUP

1a. Second dorsal fin with a long posterior lobe, which, when lifted upward, will reach about twice as high as the fin.....*S. zygaena* (Linnaeus) and relatives [*S. oceanica* (Garman) and *S. lewini* (Lord)]

1b. Second dorsal fin with a short posterior lobe, which, when lifted upward, will reach about as high as the fin.

2a. Front margin of the head between the nasal apertures lobed, the front margin not forming a single continuous curve.

3a. Head not definitely hammer-shaped; oculonarial expanse irregularly oval; teeth slender, not serrate.....*S. corona*, n. sp.

3b. Head hammer-shaped; oculonarial expanse irregularly quadrangular, almost exactly transverse in old adults; teeth heavy, serrate....*S. tudes* (Cuvier)

2b. Front margin of the head between the nasal apertures not lobed, the front margin forming a continuous curve.

4a. Teeth with low cusps, the cusps progressively smaller toward the angles of the jaws, entirely absent on 1 or 2 rows in the upper jaw and on 4 or 5 rows in the lower jaw.

5a. Head spade-shaped or heart-shaped; the greatest length of the oculonarial expanse 1.25 to 1.35 (in adults) in its greatest width; length of snout (from front of mouth to middle of the front margin of the head) in adult males 1.49 (1.42-1.54 in 7 specimens), in adult females 1.58 (1.54-1.66 in 12 specimens), in embryos 1.2 (in 6 specimens of 200-mm length) in internasal distance.....*S. tiburo* (Linnaeus)

5b. Head broadly spade-shaped; greatest length of oculonarial expanse 1.52 and 1.58 (in 2 largest specimens examined) in its greatest width; length of snout 1.63 (in 938-mm adult male), 1.75 (in 769-mm sub-adult female), and 1.6 (in 520-mm female) in internasal distance.....*S. vespertina*, n. sp.

4b. All teeth with cusps; oculonarial expanse broadly oval, roughly intermediate in shape between that of hammerheads and shovelheads; length of snout 2.2 (in 900-mm adult male and in 777-mm female) in internasal distance.....*S. media*, n. sp.

Table 1. Measurements in millimeters on shortest surface line of types and comparative material.

	tiburo BBL 666	vespertina 11584	media 11583	corona 11882	tudes BBL 309
Total length	765	769	900	663	1735
Tip of snout to—					
anterior margin orbit	78	84	105	80	200
front of mouth	55	57	65	57	100
first gill-opening	130	133	170	122	270
last gill-opening	162	160	-	160	350
anus	355	-	-	305	810
Horizontal diameter orbit	14	12	12	10	25
Vertical diameter orbit	12	11	11	10	23
Mouth, angle to angle	51	49	59	36	120
Length mouth	32	30	37	27	66
Internasal (distance)	83	100	142	103	300
Snout to origin 1st dorsal	245	240	270	218	475
Anterior margin " "	112	118*	145	110	340
Posterior margin " "	31	27	36	27	63
Distal margin " "	87	82*	-	75	265
Base 1st dorsal	63	59	81	54	160
Interdorsal (distance)	185	167	195	159	390
Anterior margin 2nd dorsal	46	42	40	27	115
Posterior margin " "	40	36	43	32	100
Distal margin " "	44	-	-	36	125
Base 2nd dorsal	34	30	37	21	90
2nd dorsal to root tail	65	58	58	48	140
Length upper caudal lobe	198	215	260	176	550
Length lower " "	76	71	101	65	230
Tip caudal to notch	47	56	64	43	95
Outer margin pectoral	124	106	118	81	250
Inner margin pectoral	40	40	42	32	75
Distal margin pectoral	100	90	112	80	205
Base pectoral	40	42	40	27	90
Outer margin ventral fin	55	50	56	37	142
Distal margin ventral fin	47	-	59	43	150
Anterior margin anal fin	34	29	44	32	110
Free posterior-basal margin anal	25	25	31	24	75
Base anal fin	52	53	68	53	100

*Fin damaged or cut at tip.

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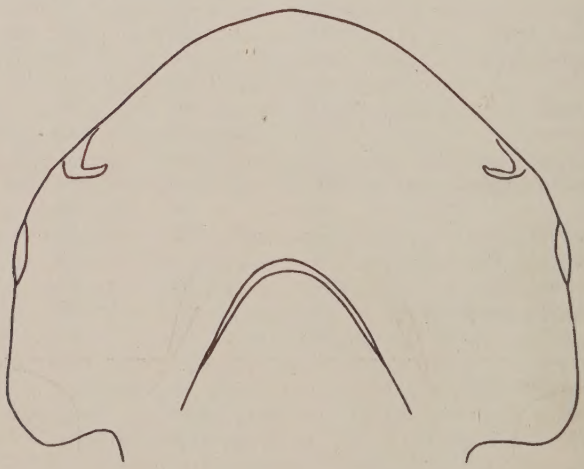

Fig. 1. *Sphyrna tiburo*, lower side of head drawn to scale from a 765-mm male collected at Englewood, Florida; BBL 666.

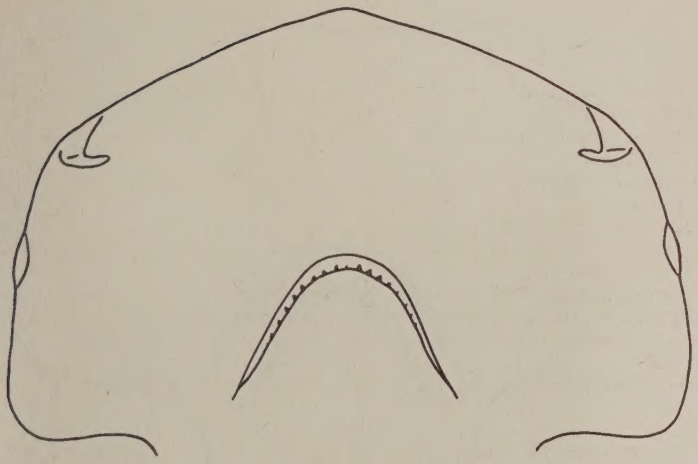

Fig. 2. *Sphyrna vespertina*, from the holotype, a 769-mm female, collected at Panama City, Panama; Stanford 11584.

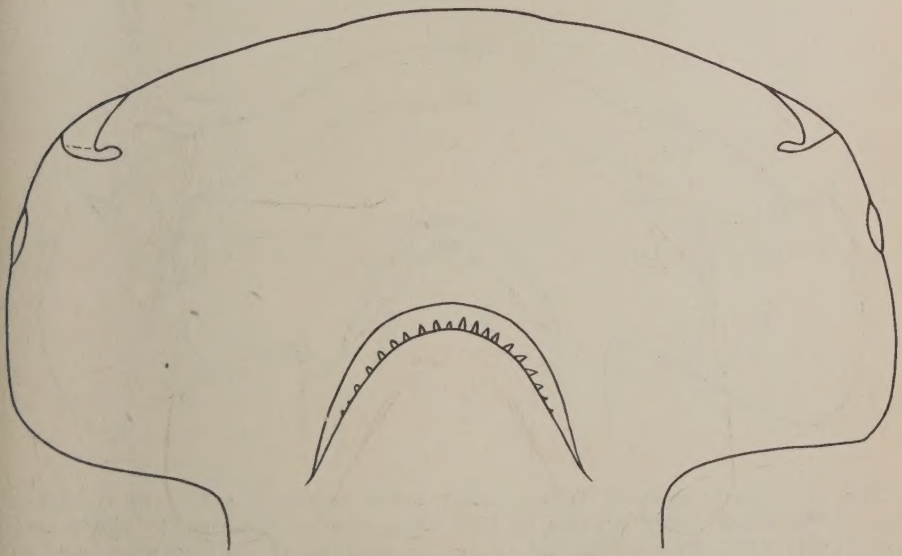

Fig. 3. *Sphyrna media*, from the holotype, a 900-mm adult male, collected at Mazatlan, Mexico; Stanford 11583.

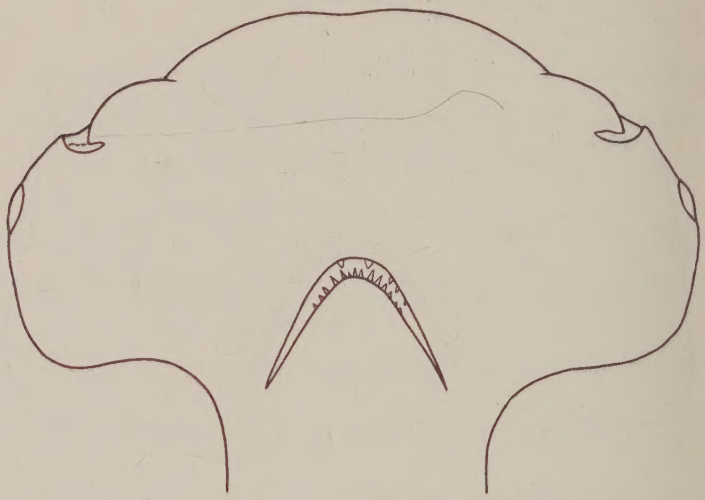

Fig. 4. *Sphyrna corona*, from the holotype, a 663-mm adult or sub-adult male collected at Panama City, Panama; Stanford 11882.

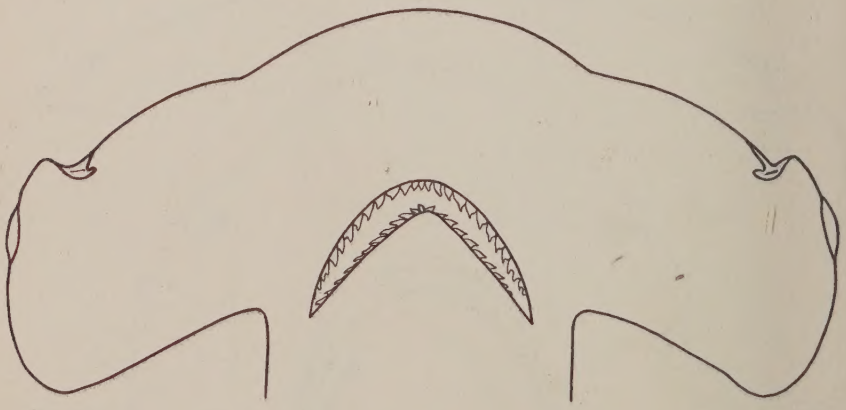

Fig. 5. *Sphyrna zygaena*, from a 590-mm new-born female collected at Livorno, Italy; USNM 28452. Other species of this group such as *Sphyrna lewini* may have a four-lobed front. The status and ranges of species of the group are not well known.

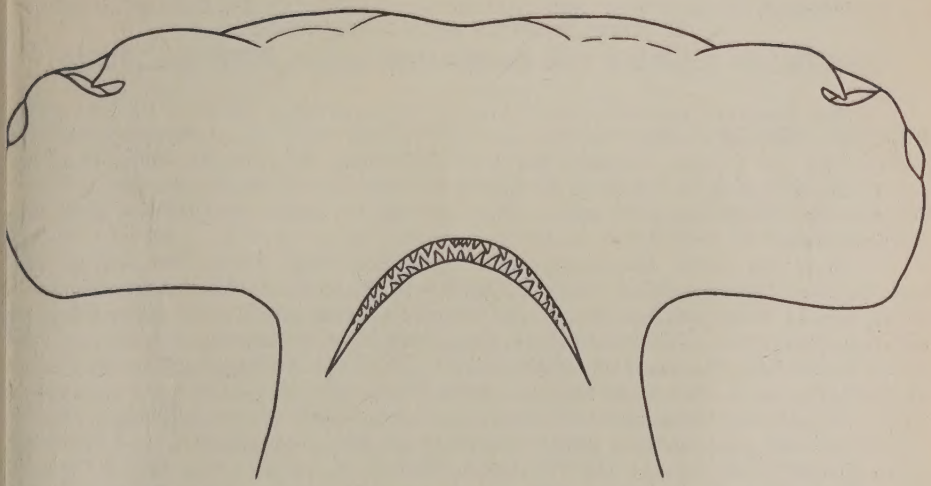

Fig. 6. *Sphyrna tudes*, from a 1735-mm half-grown male collected at Englewood, Florida; BBL 309.

Fig. 7. *Sphyrna tudes*, from a 545-mm female embryo collected at Englewood, Florida; BBL 1019a.

SUPPRESSION OF *ACAROPSIS* AND *CHALCINUS*, TWO PREOCCUPIED GENERIC NAMES OF SOUTH AMERICAN FRESH-WATER FISHES

By George S. Myers

The generic name *Acaropsis* given by Steindachner in 1875 (Sitzb. Akad. Wiss. Wien, math.-naturw. Classe, vol. 71, p. 376; type by monotypy *Acara nassa* Heckel 1840) to a genus of South American Cichlidae, is preoccupied by *Acaropsis* Moquin-Tandon 1863, an arachnid. I therefore propose to substitute the new name *Acaronia* for Steindachner's genus. There is but a single species, the genotype, *Acaronia nassa*.

Chalcinus Cuvier and Valenciennes 1849 (Hist. Nat. Poiss., vol. 22, p. 258; type *C. brachipomus* C. V., first designated by Eigenmann 1910, Repts. Princeton Univ. Exped. Patagonia, Zool., 3:440) is in current use for a genus of South American Characidae. In 1815, Rafinesque (Analyse de la Nature, Palermo, p. 126) emended the name *Chalcis* Fabricius 1787, type of the enormous group of Chalcid Hymenoptera, to *Chalcinus*. Naturally, emendations of this sort are not acceptable under the International Rules of Zoological Nomenclature, and *Chalcinus* is not even mentioned in Ashmead's great monograph on the classification of the Chalcids. However, if *Chalcis* is ever found untenable, it is conceivable that the 1815 *Chalcinus* might be called into use. A similar case has been reviewed by the International Commission on Zoological Nomenclature (Opinion 125, Smithsonian Misc. Coll., vol. 73, no. 8, 1936, p. 3). The Commission therein discussed the nomenclatural aspects of Agassiz's nomenclatorial emendations (Nomenclator Zoologicus, 1846) of many names, and decided that such emendations, although contrary to the Code, nevertheless preoccupy later generic names of identical spelling. Since the case of Rafinesque's *Chalcinus* is of just such a type, one must come to the reluctant conclusion that *Chalcinus* of Cuvier and Valenciennes must be suppressed as a homonym.

Luckily, there is an available name for the fish genus, familiar to workers in South American ichthyology. The species hitherto known as *Chalcinus* must now be referred to *Triportheus* Cope 1872 (Proc. Acad. Nat. Sci. Philadelphia, vol. 23, p. 263; type *T. albus* Cope 1872, first designated by Jordan, 1919, Gen. Fish., part 3, p. 363).

ON THE USE OF THE GENERIC NAME *BARBUS* IN ICHTHYOLOGY AND ORNITHOLOGY

By George S. Myers

In the recently published first volume of Neave's "Nomenclator Zoologicus", there is listed: "Barbus Cuvier 1798, Tab. Elém., 234.—Aves". Since this name antedates the fish genus *Barbus* of Cuvier and Cloquet 1816, the latter well known name would appear to be untenable. Not having access to a copy of Cuvier's 1798 work, I have appealed to Dr. J. P. Chapin of The American Museum of Natural History. He has kindly sent me a transcription, and from this it is perfectly evident that "barbus" of Cuvier 1798 is nothing more than the plural of Cuvier's vernacular appellation, "barbu", for which birds Cuvier plainly uses the generic name *Bucco*. There is therefore no doubt whatsoever that no genus "*Barbus* Cuvier 1798" was ever proposed, and that both Sherborn and Neave are in error in citing it. Dr. Chapin and I are in entire agreement on this, and the fish genus *Barbus* is not in danger.

[Reprinted from The Fish Culturist, Philadelphia, vol. 4, 1925, pages 370-371.]

RESULTS OF SOME RECENT STUDIES ON THE AMERICAN KILLIFISHES

G. S. MYERS

Recent studies on the New World Killifishes have brought about some interesting esults, the abstracts of a few of which are here presented.

The subgenus *Leptolucania*, which I proposed last year *(Amer. Mus. Novitates*, 16, p. 8), should be raised to generic rank. The only species is *Leptolucania mmata* (Jordan). I have given a short account of the species in the September, 924, issue of *"The Fish Culturist."*

Lucania and *Leptolucania* are set apart by their single row of teeth and the ertical mouth cleft. There seems to be but one species of *Lucania*. I can find no haracters to separate members of the nominal species, *venusta*, from specimens of *arva* collected on Long Island, N. Y. The depth is the same in both. Examination f material from Pensacola, Miami, Fort Myers, and Long Island shows that none f the alleged differences given in the systematic works are of the slightest value. he fin and scale formulas, the depth, the head length, and the fin positions are the ame in all, varying a little individually of course. The species should be known as *ucania parva* (Baird and Girard).

My supposition that *Fundulus cubensis* Eigenmann belongs to the genus *hriopeops* (loc. cit. above) seems substantiated. I have examined the types and ind them very similar to *Chriopeops goodei* (Jordan), differing chiefly in the horter preorbital. Whether or not the teeth are exactly the same as those of *goodei* cannot state without further study, as the mouths of the types are badly mutilated. he fish may stand as *Chriopeops cubensis* (Eigenmann).

The female of *Oxyzygonectes dovii* (Günther) seems not to have been described. he has a much deeper, less pointed head than the male, and the fins are shorter, ounded and hyaline.

In *Copeia*, No. 135, p. 96, I reported that the largest *Rivulus* were some *R. hartii* rom Margarita Island, 100 mm. in total length. This may still stand, for Ribeiro's *ivulus rondoni* (*Comm. Linh. Telegr. Estrat. Matto-Grosso Amazonas*, publ. 58, 1920), 1923,* p. 7), reaching 150 mm., is a very distinct genus which I shall soon escribe.

Rivulus marmoratus Poey, is distinct from *R. cylindraceus Poey*. The difference n the position of the dorsal fin distinguishes the species. Jordan and Evermann *Fishes N. M. America*, I, p. 663) state that Poey's "pectoral ocellus" (for *marmoratus*) is a misprint for "caudal." The females, at least, of *marmoratus* have *oth* a pectoral and a caudal ocellus. The male probably lacks the caudal spot, as n the other *Rivuli*, but he probably has the spot behind the pectoral insertion, as in *R. dorni* and other species. *Rivulus heyei* Nichols, from Saona Island, Santo Domingo, seems distinct from both *cylindraceus* and *marmoratus*.

Pœcilia amates Miller, *P. pittieri* Meek, and *Pœciliopsis isthmensis* Regan, eem to be distinct species. They belong to the genus *Phallichthys* Hubbs, and hould stand as *Phallichthys amates* (Miller), *Phallichthys pittieri* (Meek), and

*The date in Dr. Ribeiro's autograph, on copies received here, is July 16, 1923.

Phallichthys isthmensis (Regan).

Platypœcilus perugiæ Evermann and Clark, from Santo Domingo, is a valid species and should stand as *Limia perugiæ* (Evermann and Clark). This removes doubtful records of *L. vittata* in Santo Domingo. *Limia melanonotata* Nichols and Myers superficially resembles *perugiae* but is actually more closely related to *nigrofasciata*.

Nichols and Myers (*Amer. Mus. Novitates*, 79, 1923) report *Limia caudofasciata* Regan from Santo Domingo. This is a mistake. The fish so recorded is not *caudofasciata*, but a form very near *dominicensis*. Its relationships have not been fully worked out.

As Rachow has indicated (*Blätt. Aquar. Terr'kunde*, XXV, 1914, p. 194), *Limia arnoldi* Regan is a synonym of *L. nigrofasciata* Regan.

Heterandria zonata Nichols, 1915, is a *Limia*, but it is synonymous with *L. heterandria* Regan, 1913. Regan's locality, La Guayra, Venezuela, is wrong; it is based on aquarium fishes from Germany and it is not always possible to obtain correct data on such material. The fish actually came from Santo Domingo, as did the types of *zonata*.

The range of the common fresh-water killifish, *Fundulus diaphanus*, is usually given as south to Cape Hatteras. I have collected it much further south, at Wilmington, N. C.

Hubbs (*Misc. Publ. Mus. Zool. Univ. Michigan*, 13, 1924, p. 4) says: "The subfamily *Fundulinæ* is equivalent to the *Haplochilinæ* (properly the *Aplocheilinæ*) of Garman, a name of earlier date." The *Fundulinæ* of Jordan and Gilbert (*Bull. U. S. Nat. Mus.*, 16, 1882, p. 327) is considerably older than Garman's name (1895).

The South American Killifishes allied to *Rivulus* seem to form a rather compact group. This group, which may receive the tribe name *Rivulini*, seems well distinguished by the usually trivial character of the attached orbital rim. The genera are *Rivulus*, *Cynolebias*, *Cynopœcilus*, *Pterolebias*, *Neofundulus*, and *Trigonectes*. *Pterolebias* seems rather distinct from the others in its complete lateral line and elongated fins. *Trigonectes strigabundus*, from the Tocantins, differs from the others in the straight mouth cleft, posterior dorsal, rather deep compressed head and body, and the pointed pelvic fins. It may be identical with *Rivulus rondoni* Mir. Rib. and *Haplochilus balzanii* Perugia.

[NOTE.—The method used in printing the Stanford Ichthyological Bulletin makes possible the photographic reproduction of previously published papers, and such papers will occasionally be reproduced in this way to fill out parts of signatures that would otherwise remain blank. The above paper was published in an aquarium journal of limited circulation, and the Editor has had numerous requests for copies or reprints, which could not be supplied. Among the systematic notes therein presented was the original diagnosis of *Trigonectes strigabundus*, a new genus and species of cyprinodonts.—Editor.]

Price 50c

Obtainable from the Director of the Natural History Museum. Inquiries in regard to exchange should be addressed to the Editor of the Stanford Ichthyological Bulletin, Natural History Museum, Stanford University, California, U.S.A.